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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/688,689	10/16/2003	George H. Thiel	END920030022US1 (IEN-10-	2379
26681	7590	12/05/2005	EXAMINER	
DRIGGS, LUCAS, BRUBAKER & HOGG CO. L.P.A. 38500 CHARDON ROAD DEPT. IEN WILLOUGHBY HILLS, OH 44094			SELLERS, ROBERT E	
			ART UNIT	PAPER NUMBER
			1712	

DATE MAILED: 12/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/688,689

Applicant(s)

THIEL, GEORGE H.

Examiner

Robert Sellers

Art Unit

1712

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 10/16/2003.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 5-7 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawaoka et al. Patent No. 5,589,523

Claims 1, 5-7 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawaoka et al. Patent No. 5,589,523.

1. Sawaoka et al. discloses a thermosetting resin such as an epoxy resin (col. 7, lines 16-34) combined with a curing agent such as a polyamide, a phenol novolak resin or an addition reaction product of a bisphenol A or F diglycidyl ether and an amine, polyamide, imidazole or guanidine (col. 4, lines 24-25, 34-35, 43 and 48-63; and col. 7, lines 35, 37, 40 and 50-54) microencapsulated within a thermoplastic resin to a particle size of from 0.1 to 20  $\mu\text{m}$  (col. 2, lines 59-67). The exemplified amount of microencapsulated curing agent ranges from 7.2% by weight (col. 13, Example 7, 8 parts by weight of microcapsule curing agent per 111 parts by weight of total components) to 28.6% by weight (col. 11, Example 2, 20 parts of microcapsule curing agent per 70 parts by weight of total components). Other curing agents can be included (col. 7, lines 6-7) such as dicyandiamide at a level of 2.7% by weight (col. 13, Example 7, 3 parts by weight of dicyandiamide per 111 parts by weight of total components).

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2. The claimed encapsulated thermosetting adhesive embraces the polymeric species of curing agents set forth hereinabove which are thermosetting with the epoxy resin and exhibit adhesiveness via its ultimate utility as a prepreg for binding reinforcing fibers (col. 8, lines 31-35). The claimed curing agent reactive or causing a reaction with the thermosetting adhesive encompasses the other curing agent mixed with the microcapsule curing agent which is reactive with such species as the addition reaction product of a bisphenol A or bisphenol F diglycidyl ether and an amine, polyamide, imidazole or guanidine as the microcapsule curing agent.

3. Although the other curing agent is directed to the curing of the thermosetting resin as opposed to the claimed thermosetting adhesive in the capsule, it would have been obvious to select the other curing agent of Sawaoka et al. which will react or cause a reaction with both the thermosetting resin and microcapsule curing agent in order to obtain a more thoroughly cured product.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1-4 are rejected under 35 U.S.C. 102(a) as being anticipated by CAPLUS accession no. 2003:595414 of the Kessler et al. article.

4. Kessler et al. sets forth the self-healing of an epoxy resin composite containing a ruthenium catalyst with a healing agent of dicyclopentadiene microcapsules having a particle size of 16  $\mu\text{m}$  with a urea-formaldehyde shell.

Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kessler et al.

5. Although the claimed proportions of capsules of claims 5 and 6 and the amount of curing agent is not recited in the abstract, it would have been obvious to employ a level of microcapsules of Kessler et al. within the claimed limits in order to optimize the healing of the composite.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kessler et al. in view of Hafner et al. Patent No. 6,235,856.

6. The claimed amount of up to about 5% by weight of the curing agent is not recited. Hafner et al. (cols. 24-25, Examples 1-13) shows the use of 0.3% and 0.5% by weight of a ruthenium catalyst for the polymerization of dicyclopentadiene. It would have been obvious to use the ruthenium catalyst of Kessler et al. at concentrations of 0.3% and 0.5% by weight in order to heighten the thermocatalytic activity (col. 21, lines 30-35).

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7. More favorable consideration would be given to the limitation of the capsule size in independent claim 1 to about 10 microns or less as defined in claim 15 since the closest prior art capsule size is the 16  $\mu\text{m}$  reported in Kessler et al. There is no impetus to further reduce the particle size down to the about 10 microns or less found in claim 15. Although the Journal of Microencapsulation article by Brown et al. espouses microcapsule particle sizes of from 10-110  $\mu\text{m}$ , the publication date of November 2003 is antedated by the filing date of the instant application of October 16, 2003. The Nature article by White et al. describes a microcapsule particle size of from 50-200  $\mu\text{m}$  which is outside of the claimed maximum of less than about 25 microns.

8. None of the cited prior art recites the method of self-healing cracks formed in an underfill denoted in claims 8-14 and 16 wherein the shell of the capsule is ruptured upon encountering a crack in the underfill to fill it.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

9. CAPLUS accession no. 2002:175108 of the Sakurai article and CAPLUS accession no. 2003:446302 of the Brown et al. article are directed to an epoxy matrix containing a ruthenium catalyst and dicyclopentadiene microcapsules without the claimed particle size of less than about 25 microns.
10. Noro et al. Patent No. 6,617,046 discloses an epoxy resin underfill with a microencapsulated curing accelerator (col. 18, lines 4-17).
11. Cowger et al. Publication No. 2004/0055686 is drawn to a thermoset polymer matrix (page 1, paragraph 17) containing microcapsules of dicyclopentadiene and a ruthenium catalyst (page 3, paragraph 29). The claimed epoxy resin as the thermoset polymer matrix is not recited since the publication focuses on a tire wherein the matrix is a rubber.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert Sellers whose telephone number is (571) 272-1093. The examiner can normally be reached on Monday to Friday from 9:30 to 6:00. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at (866) 217-9197 (toll-free).

rs  
11/30/2005



ROBERT E.L. SELLERS  
PRIMARY EXAMINER